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MEXICAN FARM WAGES AND FARM LABOR PRODUCTIVITY

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By

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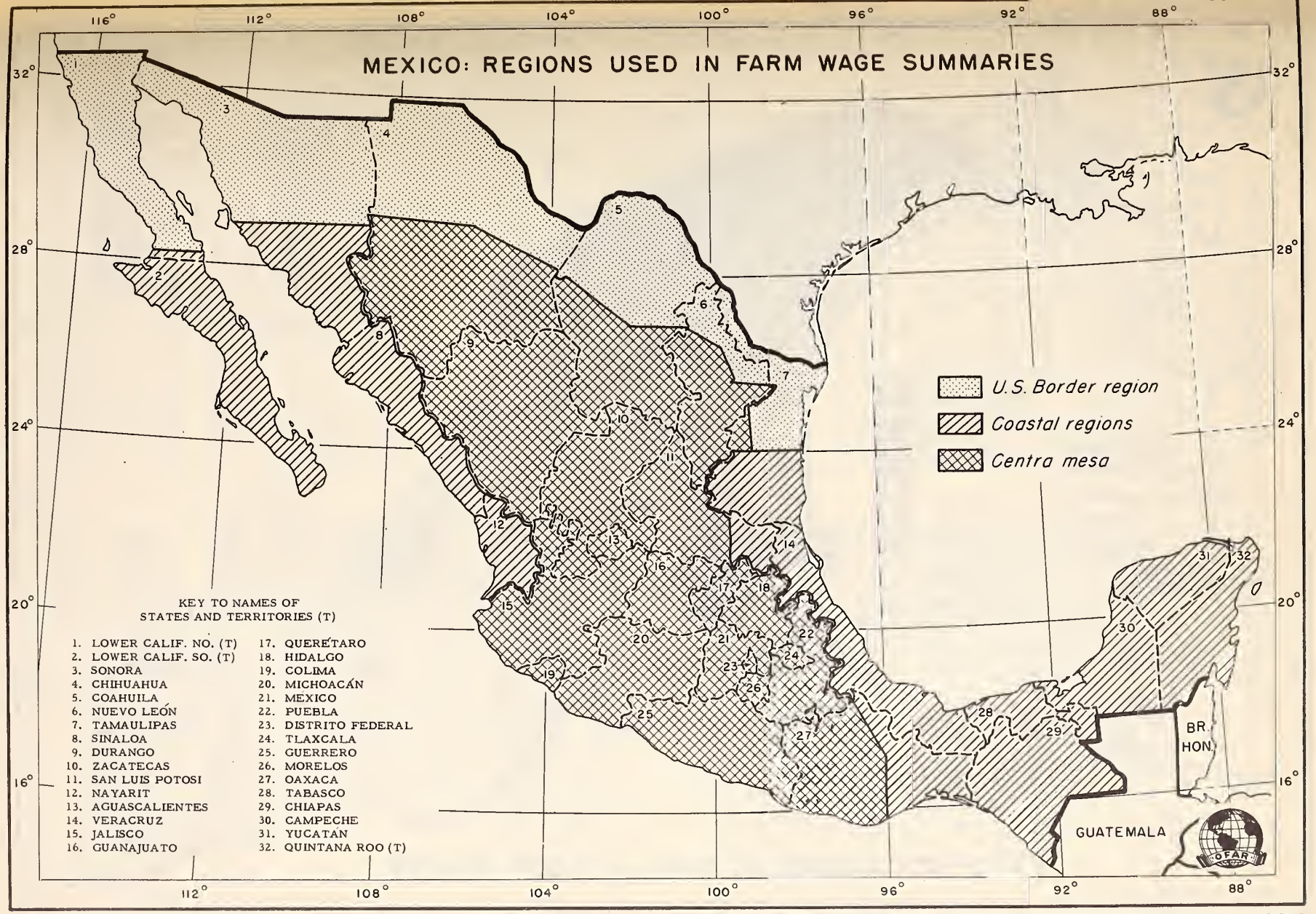

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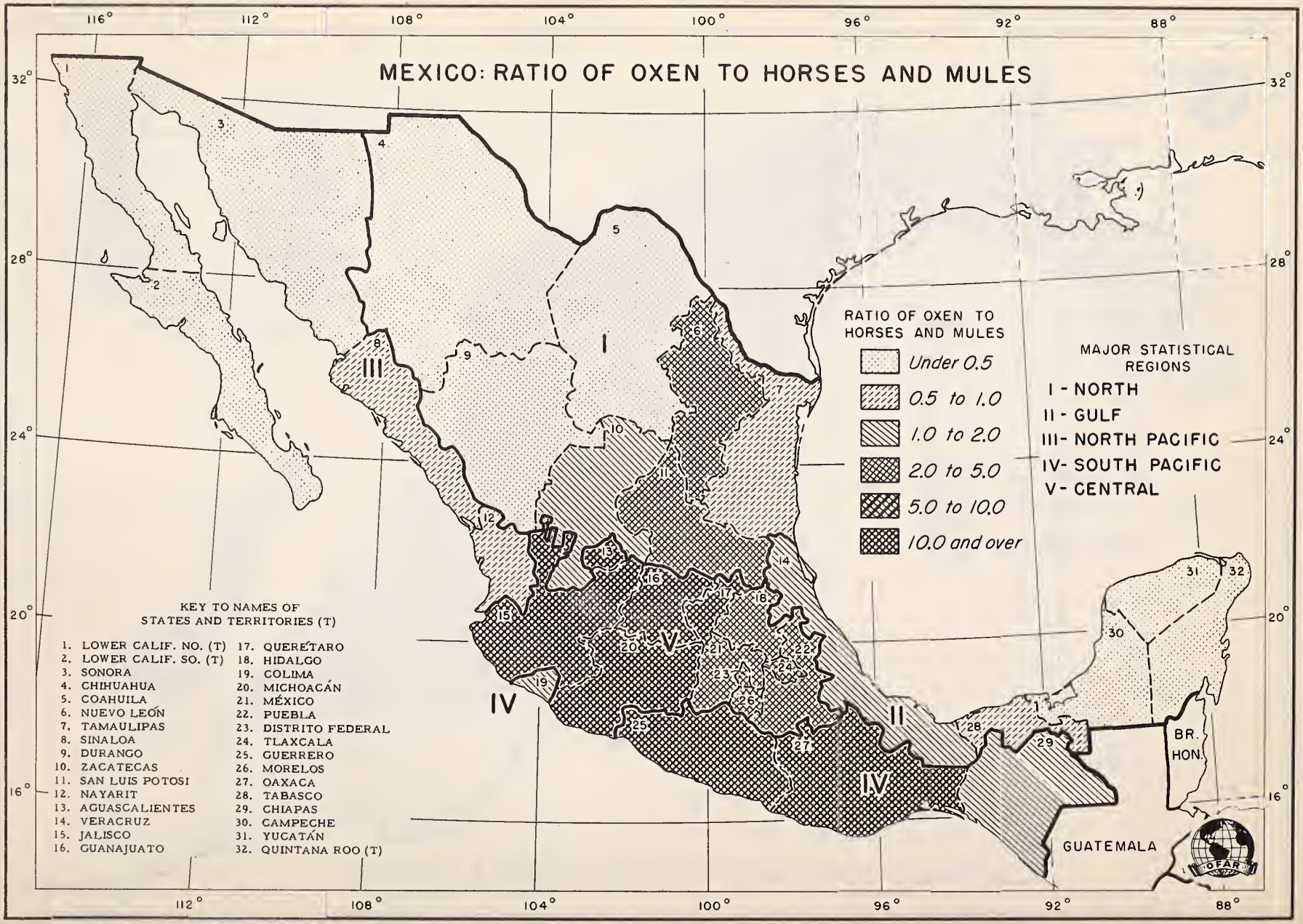

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MEXICAN FARM WAGES AND FARM LABOR PRODUCTIVITY

By John A. Hopkins

Many discussions of programs for helping other countries to improve their technologies and raise their standards of living have taken place in the United States during the past few years. Little effort, however, seems to have been spent in measuring the rates of performance that we wish to improve.

It is true that precise and detailed measurement would be difficult because of variations in the combinations of agricultural and industrial enterprises between countries. Measurement of the volume of production is also complicated because there are differences in patterns of consumption; that is, in the objectives for which products are designed. Part of the difficulty is explained by variations in cultural background. Part is caused by differences in climate, which modify the needs for housing, clothing, and even for food.

The objective of technological and economic improvement is to raise per capita production of goods and services. In nearly all the countries where greatest opportunity for such progress exists, we find a high ratio of population to production capital and a high ratio of agricultural population to tilled land. In most of them, we find that a low rate of productivity per worker in agriculture results in a high proportion of population on the land and a low proportion in manufacturing or service occupations.

The effectiveness of labor used in agriculture thus becomes one of the keys to economic progress. A nation's income (in real rather than monetary terms) ultimately consists of the goods and services that it produces itself or can obtain from other countries in exchange for its surplus products.

First priority in utilization of a nation's resources goes to the production of food and fibers. It is only after these primary physiological needs have been met that labor and other resources become available to provide comforts or personal services. Any economic or technical inefficiency in production of foods and fibers limits those fields of production that serve secondary needs. Consequently, the proportion of population engaged in agricultural production provides a rough, over-all (inverse) measure of the effectiveness with which a country's agricultural labor is used.

A second method of comparison between countries is in terms of amounts of labor used to produce equal quantities of specific crop or livestock products. Though more precise than the over-all measure, this method is also more limited in its application. Countries under comparison may produce different commodities, such as wheat in one case as against coffee and bananas in another. Among the countries of the Americas, however, this type of comparison is feasible in a large measure. There are certain crops, such as corn, potatoes, wheat, rice, and cotton, that are produced in most of the American republics.

The purpose of the present report is to summarize available data on the productivity and earning power of farm labor in Mexico. Comparisons will be made, where possible, with corresponding data for the United States and Colombia. 1/ The effectiveness with which farm labor is used in Mexico is quite similar to that in Colombia. The reason is that, over the greater part of their areas, these two countries have similar natural and economic conditions, which are typical of Andean regions. Both countries are at similar stages of technological development. Each contains large numbers of small agricultural holdings, where field work is done largely with the aid of oxen or by hand. In each there is a shortage of agricultural capital, a prodigal use of hand labor, and little animal or mechanical power.

PROPORTION OF POPULATION ENGAGED IN AGRICULTURE

The Mexican economy is primarily agricultural. According to the Mexican census of occupations of 1940, the "economically active" population was divided as follows:

	Percent
Agriculture and livestock production	65
Industry	11
Commerce	9
Mining and petroleum	2
Communication and transportation	3
Professions	0.7
Domestic labor	3
Public administration	3
Other occupations	3

The census classification 2/ of persons occupied in agriculture in 1940 is as follows:

1/ Data for Colombia are taken from Foreign Agriculture, Vol. 10, Nos. 6-7, June-July 1946, pp. 82-96.

2/ Dirección General de Estadística, Sixth Census of Population, 1940, General Summary, p. 19, 1943.

	Total	Men	Women
Owners and directors	1,217,657	1,205,162	12,495
Employees	4,850	4,680	170
Laborers	1,892,257	1,875,530	16,727
Unpaid family workers	190,648	184,787	5,861
Individuals who work alone, not owners nor directors	497,624	493,317	4,307
Total	3,803,036	3,763,476	39,560

Agricultural production in Mexico, as in most other Latin American countries, is carried on under many difficulties. Among these are exhausted soils in some regions, lack of adequate rainfall in others, and low-yielding crop varieties. But the one that stands out above all others is ineffective use of farm labor. This in turn leads to low agricultural wages and low buying power for some two-thirds of Mexico's population.

In Colombia, under similar conditions, an estimated two-thirds to three-fourths of the total population is agricultural. In the United States, on the other hand, farm population is at present about 18 percent of the total. Some 82 percent of the working force is, therefore, available for employment in industry, commerce, and personal service, in contrast with 30 or 35 percent in Mexico and Colombia.

In making these comparisons, some cognizance should be taken of the percentage of the farm labor force in each of the three countries that produces commodities for export and also of the proportions of foods and fibers that are imported. It was estimated that approximately one-fifth of the agricultural labor in Colombia is used to produce exports, the most important of which is coffee. In the United States about a tenth of the agricultural labor apparently produces commodities for export. In Mexico the proportion seems to be between those given for the other two countries. Agricultural export commodities produced in Mexico include cotton, coffee, henequen, ixtle fiber, cattle or beef, bananas, pineapples, winter vegetables, and sugar.

On the other hand, each of the three countries under discussion also imports some of the agricultural products that it requires. The United States imports, among other things, coffee, henequen, bananas, pineapples, winter vegetables, sugar, rubber, and wool. Colombia and Mexico import wheat, fats and oils, wool, and various other temperate-zone products. After making allowance for imports and exports, we may safely conclude that Mexico and Colombia use 50 to 60 percent of their available labor in producing food and fiber, compared with 16 or 17 percent for the United States.

FARM WAGES

Since December 1947, quarterly data have been obtained from United States consulates on farm wages paid in the respective consular districts. The specific request is for "unskilled farm laborers, common rate per day, without board, in pesos."

A summary of the Consulates' estimates on farm wages is given in table 1. There is a rather wide range for Mexico as a whole, with a variation in October 1949 from 9.50 pesos ($1.10 U. S. currency) per day in Mexicali to 2.70 pesos ($0.31) in the Chihuahua consular district. Estimates may be somewhat too high in certain cases and may sometimes represent wages paid near the city where the consular post is located rather than a true average of the entire district.

Nevertheless, some interesting and important conclusions can be drawn from these data. The average level of wages in interior consular districts is lower than in districts adjacent to the United States border or in the hot, coastal regions. In the border region the average for October 1949 was 5.98 pesos ($0.69 U.S. currency) per day, as compared with 3.33 pesos ($0.38) in the central mesa, and 6.10 pesos ($0.71) in the consular districts located in the coastal areas.

TABLE 1.--Farm wages per day, without board, for unskilled men, selected months, averages, 1947-49 Mexico[1]

Year and month	Value of peso	U.S. Border areas	Central mesa	Coastal areas
	Dollars	*Pesos*	*Pesos*	*Pesos*
1947:				
December	--	5.36	3.02	4.92
1948:				
April	--	5.22	3.04	5.12
July	--	5.78	2.81	5.41
October	--	5.91	3.07	5.40
1949:				
January	--	5.89	3.16	5.73
April	--	6.06	3.04	5.70
July	--	5.96	3.15	5.90
October	--	5.98	3.33	6.10
		Dollars	*Dollars*	*Dollars*
1947:				
December	0.2061	1.10	0.62	1.01
1948:				
April	.2061	1.08	.63	1.06
July	.2061	1.19	.58	1.12
October	.1444	.85	.44	.78
1949:				
January	.1453	.86	.46	.83
April	.1430	.87	.43	.83
July	.1156	.69	.36	.68
October	.1156	.69	.38	.71

[1]Simple averages of reports from U. S. Consulates in the respective areas.

The general levels of Mexican farm wages stated above were verified by information obtained from the Dirección de Economía Rural of the Ministry of Agriculture and by interviews with farm operators and other informed

persons. There are some minor differences between sources. In the border areas the consular data are slightly above those from the Ministry of Agriculture.

Effect of Peso Devaluation

Prior to July 21, 1948, the Mexican peso was valued at 20.62 U.S. cents. After that date the Mexican Government ceased supporting the value of the peso and it fell rapidly, ending the year at a value of 14.56 U.S. cents. During the first half of 1949 there was a new decline. Finally the peso was again stabilized on July 18 at a level of 11.56 U.S. cents. As shown in table 1, wages in terms of pesos rose much less than would have been required to offset the fall in the peso. In December 1947 the dollar equivalent of Mexican farm wages in areas along the United States border averaged $1.10 per day. In October 1949 the dollar equivalent in the same area was 69 cents. In the coastal areas the dollar equivalent was $1.01 per day in December 1947 and was 71 cents in October 1949. In the central mesa the corresponding figures were 62 cents and 38 cents, respectively.

Mexican prices of farm products, both at wholesale and at retail, rose by relatively small amounts between July 1948 and the latter part of 1949. Nevertheless, prices expressed in pesos rose more than did wages, and, consequently, there was some decline in the buying power of labor.

BUYING POWER OF MEXICAN FARM LABOR

In January 1948, after a short corn crop, a farmer in the United States could have paid for a month of farm labor with the market returns from 43 bushels of corn sold in Chicago (table 2). In October 1949, after some further increase in United States wages and two large corn crops, the United States farmer would have needed to sell 97 bushels to pay for a month of labor.

In Mexico the farmer in the regions adjacent to the United States border needed to pay only 10.9 bushels of corn to hire a month of labor in December 1947 and 12.0 bushels in October 1949. In the densely inhabited central mesa region, where labor is cheaper, a farmer could have hired a month of labor for 8.7 bushels of corn in December 1947 or 8.0 bushels in October 1949. In the more thinly settled and less healthful coastal districts, the farmer had to pay the equivalent of the price of 14.4 bushels in December 1947 and 13.0 bushels in October 1949.

Corn is used for this comparison because it is produced in virtually every part of Mexico and is the major crop of that country as well as of the United States. Under these conditions the comparison between farm wages and corn prices seems to be a fair one, despite the fact that prices and wages of different countries are extremely difficult to compare. Though the

TABLE 2.--Value of farm labor in Mexico and the United States in terms of corn, December 1947 and October 1949

Item	Mexico			United States
	U.S. border region	Central mesa	Coastal region	
	Pesos[1]	*Pesos*[1]	*Pesos*[1]	*Dollars*
Wages for month (25 days):				
December 1947	134.00	75.50	123.00	[2]118.15
October 1949	152.50	83.33	155.50	120.00
Price of corn (Mexico, per metric ton; U.S., per bushel):				
December 1947	485.70	341.70	336.80	[2] [3]2.72
October 1949	500.00	411.30	471.20	1.24
Bushels of corn equal to 1 month's wages:				
December 1947	10.9	8.7	14.4	[2]43.4
October 1949	12.0	8.0	13.0	96.8

[1]The peso was equivalent to 14.53 U. S. cents in December 1947, and to 11.56 cents in October 1949.

[2]January 1948.

[3]Spot price in Chicago for No. 2 yellow corn.

Sources:
Mexican farm wages and prices of corn were obtained from reports from U. S. consuls.
U. S. farm wages from Agricultural Prices, U. S. Bureau of Agricultural Economics.
Chicago corn prices from Journal of Commerce, New York.

comparison may not be exact, it is still safe to say that in 1947 farm laborers in Mexico earned only from one-fifth to one-third as much (in terms of corn) as did similar laborers in the United States. For October 1949 the corresponding range was from one-eighth to one-twelfth as much.

Data are not available for comparing the standard of living of farm workers in Mexico and in the United States. Even if statistics on consumption of various commodities were at hand, the comparison would still be difficult, if not meaningless, because of differences in climate, tradition, and education of the laborers of the two countries. It is obvious, however, that the standard of living of the Mexican farm worker is a meager one.

This relationship between wages and the value of farm products is extremely important. The low buying power of labor is not, however, peculiar to Mexico. In the Colombian study previously referred to 3/ it was found that wages for a month of farm labor would buy only one-eighth to one-twelfth as much corn, rice, or potatoes in Colombia as it would in the United States in 1945.

Conditions and methods of agricultural production over large areas of Colombia are very similar to those in Mexico. The low value of farm labor is determined by these conditions and not by the nationality of the regions studied.

We may expect to find low production per worker in any region that is characterized by:

1 A low state of technical education of many farm operators and laborers.
2 A shortage of capital and, consequently, a prodigal use of human effort.
3 Presence of large areas of rough land that makes cultivation difficult and laborious.
4 Prevalence of agricultural holdings too small to permit economical use of power implements.
5 Low-yielding strains of crops and livestock.

These influences and the difficulties that they impose on technological and economic progress will be discussed at greater length in the following pages.

PRODUCTIVITY OF MEXICAN FARM LABOR

The principal explanation of the wide discrepancy in farm wages between the United States and Mexico is found in the difference in labor productivity. This is the combined effect of low yields and high labor input. In Mexico the average yield of corn in the years 1935-44 was 9.3 bushels per acre, compared with 28.4 in the United States as a whole and 45.0 bushels in the four central Corn Belt States. In wheat production in the same years the Mexican average was 11.3 bushels compared with 15.2 in the United States. Rice and cotton yields more nearly approximated those in the United States, whereas the Mexican yield of sugarcane was higher.

TABLE 3.--Harvested area and yield of principal Mexican crops, 1935-44 averages

Crop	Area 1,000 acres[1]	Percent of total crop area[2]	Yield per acre	
			Mexico[1]	[3]United States
Corn	7,956	55.2	9.3 bushels	28.4 bushels
Beans	1,571	10.9	190 pounds	877 pounds
Wheat	1,318	9.1	11.3 bushels	15.2 bushels
Cotton	790	5.5	232 pounds[4]	[4]241 pounds
Barley	382	2.6	11.1 bushels	23.1 bushels
Coffee	304	2.1	405 pounds	--
Henequen	269	1.9	850 pounds	--
Sugarcane	261	1.8	21.8 tons	20.2 tons
Sesame	203	1.4	426 pounds	--
Rice	126	.9	38.5 bushels	47.3 bushels
10 listed crops	13,180	91.4	---	---
41 crops	14,414	100.0	---	---

[1]Source: Boletin Mensual de la Dirección de Economia Rural, No. 257, October 1947, Secretaría de Agricultura y Ganadería.

[2]41 listed field crops.

[3]Source: Agricultural Statistics, 1947, United States Department of Agriculture.

[4]Lint cotton.

3/ Foreign Agriculture, Vol. 10, Nos. 6-7, June-July 1946, p. 92.

TABLE 4.--Labor productivity for selected crops and areas, Mexico and United States

Crop	Mexico				United States			
	Area	Hours per acre[1]	Yield per acre[1]	Production per man-month	Area	Hours per acre[2]	Yield per acre[3]	Production per man-month
			Bushels	*Bushels*			*Bushels*	*Bushels*
Corn, (non-irrigated)	Guanajuato	126	13.4	21	Iowa	16.5	46.9	567
	Jalisco	111	12.7	20	Georgia	37.7	10.6	56
					United States	27.3	28.4	207
Wheat (irrigated)	Baja California (Mexicali):							
	Tractor farms	21	14.9	141	Kansas	4.6	13.6	592
	Sonora (Cajeme)							
	Laguna:							
	Mule farms	64	20.6	64	Pennsylvania	18.1	20.2	224
	Tractor farms	18	17.8	196				
	Puebla-Tlaxcala:							
	Mule farms	83	11.9	29	United States	8.7	15.2	350
	Ox farms	104	11.9	23				
Rice, paddy (irrigated)	Sonora	96	30.0	62	Louisiana	33.0	39.9	243
	Morelos	526	79.3	30	California	30.0	66.2	444
					United States	32.0	47.3	296
			Pounds	*Pounds*			*Pounds*	*Pounds*
Cotton (seed-cotton basis):								
					Mississippi	118.0	904	1,537
Irrigated	Northeast Mexico	145	1,100	1,516	Texas	54.0	450	1,665
Nonirrigated	... do	96	450	936	United States	91.0	662	1,456
			Short tons	*Short tons*			*Short tons*	*Short tons*
Sugar (preharvest):								
Irrigated	Sinaloa	140	35.7	51.0	Louisiana	94.0	19.1	40.6
Do	Morelos	350	40.1	23.5	Florida	137.0	32.0	46.7
Nonirrigated	Tabasco	207	35.7	34.5	United States	97.0	20.2	41.6

[1]Embassy estimates based on data from Mexican Ministry of Agriculture and other sources.

[2]Source: U.S. Bureau of Agricultural Economics, Mimeograph F.M. 40, Labor Requirements for Crops and Livestock, M. R. Cooper, W. C. Holley, H. W. Hawthorne, and R. S. Washburn, May 1943.

[3]Averages for 1935-44 from Agricultural Statistics, 1947.

Table 3 summarizes the area harvested and yields of 10 leading Mexican crops, which together comprise about 90 percent of total acreage in the 41 leading crops. It will be noted that yields of corn and beans, the 2 crops occupying the greatest area, compared most poorly with those in the United States. The higher value commercial crops, such as sugarcane, cotton, and rice, get the better land and more favorable growing conditions. Most of the corn and beans, on the other hand, are planted on poor and unirrigated land, under growing conditions much less favorable than those in the principal agricultural regions of the United States. In addition, the United States is further advanced in the use of improved crop varieties, in improved cultural methods, and in the use of fertilizers.

Even if the Mexican farm worker used equally efficient methods and the same number of hours per acre in crop production as are used in the United States, his productivity would be much less because of the prevailingly low yields.

LABOR USED IN PRODUCING SELECTED MEXICAN CROPS

Estimated amounts of labor used in producing five Mexican crops in important producing areas are shown in table 4. It is not uncommon for a Mexican farmer to spend a day for every hour that an American farmer would use in growing the same crop. In producing corn in two districts of the central mesa, it is estimated that 111 and 126 hours per acre were used in planting, cultivating, and harvesting the crop compared with a United States average of 27.3 man-hours per acre. The Mexican crop was produced with oxen, which comprise the most common source of power for Mexican agriculture, and the chief implement was the wooden plow.

In one of the examples given, the land was reported as plowed (13 man-hours per acre) and then cross-plowed (6.5 man-hours). In the other case, cross-plowing was not reported, although it is generally necessary in order to obtain a satisfactory seedbed with the wooden plow. In all, the production of corn in these two representative areas of central Mexico required 26 to 32 man-hours per acre to prepare the land, 13 to 16 to plant, 28 to 39 to cultivate and hoe, and 38 to 44 man-hours to harvest. The crop was estimated at 13.4 bushels per acre in one of these cases and 12.7 bushels in the other.

Thus the production of grain per man-month (25 days of 8 hours each) amounted to 21 and 20 bushels, respectively, in the two Mexican cases, compared with 207 bushels per man-month in the United States. Of course, man-labor input and yield vary from region to region in both the United States and Mexico. In the United States, corn production per man-month was estimated in 1943 to be 56 bushels in Georgia and 567 bushels in Iowa.

There are some regions in Mexico, as in other tropical regions of Latin America, where corn or other crops are produced without animal or mechanical power. In these sections the land is cleared of brush by hand. The brush is burned, and, while the soil is soft and friable after the fire, the seed is planted by hand, usually with the aid of a stick or hoe. The crop is then weeded with a hoe or machete. Three municipalities in Chiapas reported this method of raising corn (table 5). Labor reported per hectare (2.471 acres) when this method was used averaged 59.6 man-days. In the 21 municipalities where power was furnished by oxen, 37.1 man-days per hectare were used. In the 3 municipalities using mule power, the average amount of labor was 23 man-days per hectare.

Similar comparisons might be made between Mexican labor requirements and those in the United States on various other crops. Table 4 shows that in wheat production the number of man-hours per acre varies from 18 to 104

TABLE 5.--Estimate of days' work[1] used in producing 1 hectare[2] of corn in Mexico, by type of power used, 1948

Operation	Hand labor[3]		Oxen[3]		Mules[3]	
	Man-days	Ox-days	Man-days	Ox-days	Man-days	Mule-days
Preparation of soil	16.0	0	8.8	12.5	6.3	12.0
Planting	2.3	0	3.9	3.3	2.7	5.3
Cultivating and hoeing	22.0	0	10.1	8.8	5.3	5.3
Harvesting	19.3	(4)	14.3	.8	8.7	[5] 2.0
Total	59.6		37.1	25.4	23.0	24.6

[1]The workday is usually calculated as 8 hours.
[2]A hectare equals 2.471 acres.
[3]Number of municipalities represented: For hand labor and mules, 3; for oxen, 21.
[4]Oxen are sometimes used to haul corn from the fields.
[5]Embassy estimate.

Source: Embassy estimates based on data from the Mexican Ministry of Agriculture and other sources.

among the four regions reported. The production per man-month varied from 196 bushels, where large machinery was used in the Cajeme region of Sonora, to 23 bushels on farms using oxen for power in the States of Puebla and Tlaxcala. All the estimates just given represent wheat production on irrigated land. These figures may be compared with an average production of 350 bushels per man-month in the United States. In the latter country, however, there is also a rather wide variation. Thus 224 bushels were produced per man-month in Pennsylvania as contrasted to 592 bushels in Kansas.

In the production of rice, there is a very wide spread in the reported amounts of labor applied per acre. In the Yaqui Valley of Sonora, where large machinery is used, an average of 96 man-hours per acre was reported. In contrast to this, 526 man-hours were reported from ejidos in the State of Morelos. In both areas, relatively low wages lead to the use of labor much more freely than in the United States. In the Morelos area, however, labor is more plentiful than in Sonora, and good land is much more scarce. Consequently, the crop in Morelos is given meticulous care, and in addition equipment and methods are more primitive. As an illustration, on the ejidos from which the Morelos data were obtained, the young rice plants were purchased from outside the ejido and were then transplanted in the fields by hand. In Sonora the quantity of rice produced per man-month was one-fifth as much as the average for the United States. In Morelos it was only one-tenth as high as for the United States.

In cotton production the average man-labor input reported for three areas in northeastern Mexico averaged 145 man-hours per acre with irrigation and 96 without irrigation. These figures may be compared with 91 man-hours for the United States. Productivity per man-month was slightly better than the United States average on the irrigated land, and was about 60 percent as high on the land that received no irrigation. In sugar production, figures on production per man-month were between one-fourth and one-fifth above the United States average on a large sugar plantation in Sinaloa, but slightly more than one-half the United States rate in Morelos.

It was shown in table 2 that the Mexican farmer in October 1949 could hire a month of farm labor for one-twelfth to one-seventh as much corn as could a farmer in the United States. Table 4 shows that in two representative sections of the central mesa, a man-month of labor would produce only about one-tenth as much corn as would a man-month spent in raising corn in the United States.

For wheat, the labor productivity of Mexican farm workers was shown to be from 7 to 56 percent as high as the United States average, though not much wheat is produced at the higher ratio. For rice, the corresponding comparisons are from 10 to 20 percent of the United States average. For cotton, labor productivity is 104 percent of the United States average in one case and 64 percent in the other. For sugarcane prior to harvest, the Mexican rates are 66 to 122 percent as high as in the United States. It is very likely that Mexican productivity has been somewhat overstated in these examples by estimates of relatively high yields. It will be noted that yields reported in table 4 are generally above national averages as given in table 3.

The data given in table 4 cover only a relatively small part of Mexico. It may be noted, however, that the highest labor productivity occurs in those cases from northwestern Mexico--Sonora, Sinaloa, Baja California--and from northeastern Mexico. These are the regions where new lands are being opened up, where the largest capacity equipment is used, and where there is the least pressure of population on land. It is no accident that these are also the areas with the highest farm wages.

All things considered, it is quite possible that the Mexican farm worker is receiving as wages about the same fraction of his total production as is the farm worker in the United States. But it would, of course, be an enormous statistical task to collect all the data needed to determine the specific relationship.

The high labor requirements just described for Mexico are typical of those in many other Latin American regions. In the Colombian study (footnote 1), it was found that in one typical section about 90 hours per acre were used to raise corn with the aid of a tractor. On smaller acreages, where the work was all done by hand, the figure was almost twice as high. Rice production in Colombia, with some aid of a tractor, required up to 150 hours per acre. In raising wheat, 50 to 175 hours were used per acre, depending on the conditions and methods used. A typical requirement for cotton production was 246 hours per acre in a region where most of the work was done by hand or with the aid of oxen. When a tractor was employed to prepare the seedbed and cultivate the crop, the requirement was 135 hours.

POWER AND IMPLEMENTS

The most widely used implement in Mexico is the wooden plow, and power is most commonly furnished by a yoke of oxen. As shown in table 6, wooden plows outnumber steel plows in each of the three groups of farms. Steel plows, like wooden ones, are mostly one-bottom implements. This is indicated by the fact that the average valuation placed on such plows in the Mexican agricultural census of 1940 was 26.6 pesos, slightly under $5.00, whereas the corresponding valuation on wooden plows was only 6.2 pesos--about $1.00.

The wooden plow is used to prepare the seedbed by plowing and then cross-plowing. It is likewise used to cultivate such row crops as

corn by plowing a couple of furrows on each side of the corn row--incidentally cutting off many of the corn roots and thereby reducing yield.

According to the 1940 census, there were 115 plows (combining wooden and steel ones) per 1,000 hectares cultivated on farms of more than 5 hectares in size. On privately owned farms of 5 hectares or less, the corresponding number was 428, and on ejidos it was 178. In contrast to these figures, there were only 7.2 mechanical cultivators for 1,000 hectares, taking all types of farms together, and only 2.8 planters and seeders.

The total investment in machinery averaged 44.57 pesos ($8.27 U.S. currency) per farm. For farms of 5 hectares or less the corresponding figure was 6.39 pesos. For farms of more than 5 hectares the figure was 170.77 pesos, and for ejidos it was 43.49 pesos. These figures may understate the true values of the machines listed. Even if they represent only half of the sums that could be obtained by selling the implements in question, however, Mexican farmers still had an extremely low investment in farm equipment. It is worthy of note in passing that the average tractor was represented as worth 3,122 pesos ($576 U.S. currency). If we assume that the average tractor in the country was half worn out at the time of the census, this figure may not be unrealistic.

Since 1940, Mexican farmers have been buying additional equipment at a rapid rate. Table 7 shows that the valuation of imported farm machinery rose from 10.7 million pesos ($2.0 million) in 1940 to 126.4 million in 1948. This may be compared with a total valuation of all equipment on Mexican farms in 1940 of only 105 million pesos ($19.5 million).

Slightly more than 40 percent of the reported imports throughout this 9-year period represented tractors, of which 23,766 were imported in the 9 years.

TABLE 6.--Agricultural machinery, Mexico, 1940

Item	Ejidos	Private properties		Total or average
		5 hectares or less[1]	Over 5 hectares	
	Number	*Number*	*Number*	*Number*
Implements:				
Steel plows	404,846	110,828	214,053	729,727
Wooden plows	461,981	212,066	251,360	925,407
Planters and seeders	10,578	328	16,219	27,125
Iron harrows	12,697	2,173	17,660	32,530
Mechanical cultivators	34,653	1,243	33,223	69,119
Tractors	958	--	3,646	4,604
Farm operators	1,139,085	928,593	290,336	2,358,014
Hectares cultivated (1,000)	4,859	754	4,024	9,637
Implements per 1,000 hectares cultivated:				
Steel plows	83	147	53	76
Wooden plows	95	281	62	96
Planters and seeders	2.2	.4	4.0	2.8
Iron harrows	2.6	2.9	4.4	3.4
Mechanical cultivators	7.1	1.6	8.2	7.2
Tractors	.2	--	.9	.5
Value per implement (Weighted average):	[2]*Pesos*	*Pesos*	*Pesos*	*Pesos*
Steel plows	27.9	24.5	25.0	26.6
Wooden plows	6.4	7.3	4.8	6.2
Planters and seeders	118.4	167.7	95.3	105.2
Iron harrows	95.2	82.8	94.8	94.2
Cultivators	28.3	77.2	48.5	38.9
Tractors	5,248.5	--	2,551.10	3,112.3
Total value, machinery per operator	43.49	6.39	170.77	44.57
	1,000 pesos	*1,000 pesos*	*1,000 pesos*	*1,000 pesos*
Total value machinery	49,533	5,876	49,581	104,990

[1]A hectare equals 2.471 acres.

[2]Average value of the peso in 1940 was 18.55 U.S. cents.

Source: Mexican Census of Agriculture, 1940.

TABLE 7.--Mexican imports of agricultural machinery and tools, 1940-48

Year	Total tools and machinery	Tractors	Other tools and machinery	Tractors
	1,000 pesos	*1,000 pesos*	*1,000 pesos*	*Number*
1940	10,723	3,643	7,080	675
1941	20,810	9,423	11,387	1,626
1942	14,548	3,854	10,694	517
1943	19,659	9,245	10,414	1,420
1944	31,637	13,235	18,402	2,028
1945	31,699	11,712	19,987	2,788
1946	45,087	18,645	26,442	2,972
1947	66,368	29,458	36,910	4,846
1948	126,443	56,038	70,405	6,894

Source: Dirección General de Estadística.

The 1940 agricultural census listed twice as many oxen or other cattle used as work animals as horses and mules combined 4/. The slow gait of the ox is one of the important reasons that crop production in Mexico and most other Latin American countries requires such a large amount of time per acre or per ton of crop produced, since it often takes 12 to 20 man-hours to plow and cross-plow an acre of land.

The proportion of oxen and cows on the one hand and horses and mules on the other, as shown in table 8 and figure 2, varies widely in different parts of the country. In the States bordering on the United States, there are fewer oxen than horses and mules. The same is true of the newly developed agricultural regions on the west coast, especially in Sonora, Sinaloa, and Nayarit. In the eastern part of the central mesa, from Nuevo Leon to Puebla, there are between 2 and 5 times as many oxen as horses or mules. West of this region, from Jalisco and Guanajuato, southward to Oaxaca, oxen outnumber the other draft animals by more than 10 to 1.

These last 2 regions are the ones with most intensive agriculture, where the use of slow-moving draft animals causes the greatest total loss in man-hours. The intensive agriculture and small parcels of cropland in this region, however, are the principal reasons that oxen are kept rather than mules or tractors. Oxen are somewhat cheaper to take care of (per head) than are mules or horses and require less supplementary feed. Consequently, if the farm is small and does not fully utilize even 1 pair of draft animals, a yoke of oxen will be cheaper to support than a pair of horses or mules. On a larger farm the greater amount of work performed by the horses and the saving in labor will more than offset the higher cost of feed and care.

4/ The 1940 agricultural census gives a total of 3,447,066 horses and mules in Mexico. It is not known how many of these are colts. The same census indicates that only 927,419 horses and mules were used for farm work. In this case, apparently farm work means field work, such as plowing and cultivating. The majority of horses and mules in Mexico are used for riding or as pack animals for hauling farm produce out of regions where roads are few or poor.

SIZE OF FARM

One important reason that Mexican farm labor is used less efficiently than that in the United States is found in the small size of most Mexican farms.

According to the 1940 census, Mexico had 9,637,129 hectares (23,804,000 acres) of cultivated land. Of this, 50 percent was in ejidos, 8 percent in private properties of 5 hectares or less, and 42 percent in properties of more than 5 hectares. The ejidos averaged 24.5 hectares (60.5 acres) of all land per ejidatario, but of this, only 6.2 hectares (15.3 acres) were reported as tillable and only 4.3 hectares (10.6 acres) per ejidatario were cultivated.

Among the 928,593 private farms of 5 hectares or less, 497,000, in round numbers, had less than 1 hectare, and 431,000 had between 1 and 5 hectares in total land. These included many vegetable and fruit farms, also many small plots in or adjacent to cities, on which there are herds of dairy cattle or enterprises of poultry or hogs.

Farms with more than 5 hectares of all land numbered 290,336. Of these, however, 56,842 reported no tilled land and were chiefly livestock ranches. The other 233,494 averaged 28.6 hectares (70.6 acres) each of tilled land. This last group of farms is the only one that resembles typical farms in most regions of the United States, as far as area per unit is concerned. This group may be compared with farms in Iowa or Illinois. In 1940, Iowa had approximately 212,000 farms with an average of 96 acres in cropland. Illinois had a total of

TABLE 8.--Animals used in agricultural work in Mexico, 1940

Areas	Horses and mules	Oxen and cows	Ratio of oxen to horses and mules
Total[1]	927,419	1,868,429	2.01
North	455,573	357,469	.78
Gulf	63,676	85,916	1.35
North Pacific	157,705	63,817	.40
South Pacific	32,818	246,942	7.52
Central	217,647	1,114,285	5.11
Ejidos	426,654	614,101	1.44
Private properties:			
Over 5 hectares[2]	235,070	461,739	1.96
5 hectares or less	265,695	792,589	2.98

[1]For composition of the regions listed see figure 2.

[2]A hectare equals 2.471 acres.

213,000 farms with an average of 97 acres in cropland.

Tables 9 and 10 show distributions of privately owned Mexican farms by size groups. It is a striking fact that only 101,585 farm units were reported with more than 10 hectares (24.7 acres) of tilled land per farm. The remaining farms are too small to make economical use of ordinary tractors and, in the majority of cases, can use only animal power.

The presence of productive livestock may offset relatively low efficiency on crop raising by providing a supplementary demand for labor. In the United States the average farm operator has about 13 head of cattle, 9 or 10 hogs, 6 sheep, and 1.5 horses or mules. How do the numbers of livestock on Mexican farms compare with these figures? Table 11 shows that in 1940 the average privately owned farm of more than 5 hectares had an average of 16.5 cattle, 3.5 horses and mules, 4.8 sheep, and 1.6 hogs. On private properties of 5 hectares or less, there was an average of 4.5 cattle, 2.0 sheep, and 3.2 hogs. Each of these small farms, it will be noted, had about twice as many hogs and poultry as did the larger ones. The ejido farmer averaged only 2.3 cattle, 1.0 sheep, 1.5 hogs, and 10.9 head of poultry per ejidatario. The comparison, per farmer, with numbers in the United States is less favorable than might at first appear, especially on the larger farms, because this group of 290,000 farms employs by far the greater number of the 763,726 farm laborers reported in the 1940 agricultural census.

It is difficult to change the size of farm units, as experience has shown in the United States and elsewhere. Combination of small farms into larger ones occurs very slowly, even though there are obvious economic advantages to be gained by increase in size of unit up to a certain level. For many years, therefore, the great bulk even of the privately owned Mexican

TABLE 9.--Number of privately owned Mexican agricultural properties, by size of unit, 1940

Size in hectares[1]	Number	Percentage
Total	1,219,839	100.0
Less than 1	497,378	40.8
1 to 5	431,125	35.4
5.1 to 10	74,187	6.1
10.1 to 25	83,013	6.8
25.1 to 50	46,466	3.8
50.1 to 100	31,763	2.6
100.1 to 500	40,123	3.2
500.1 to 1,000	6,087	.5
1,000.1 to 5,000	6,883	.6
5,000.1 or more	2,814	.2

[1]A hectare equals 2.471 acres.

Source: Agricultural Census of 1940, data published in Compendio Estadístico, 1947, pages 254-258, Dirrección General de Estadística.

TABLE 10.--Number of Mexican farm properties by tilled area per farm, on properties of more than 5 hectares[1] [2], 1940

Tilled land per farm	Number of farms
None	56,842
5 hectares or less	60,590
5.1 to 10	71,319
10.1 to 25	57,577
25.1 to 50	24,101
50.1 to 100	12,077
100.1 to 200	5,092
200.1 to 400	1,464
400.1 or more	1,274

[1]Number of farms with more than 5 hectares of total land: 290,336.

[2]A hectare equals 2.471 acres.

Source: Compendio Estadístico, 1947, pages 259-264.

TABLE 11.--Livestock in Mexico, 1940

Livestock	Ejidos	Private properties	
		5 hectares or less[1]	Over 5 hectares
	1,000	*1,000*	*1,000*
Total livestock:			
Oxen[2]	641	793	461
Other cattle	2,028	3,358	4,337
Horses and mules	1,023	1,396	1,029
Burros	779	1,323	216
Sheep	1,163	1,888	1,402
Goats	2,220	2,967	1,657
Hogs	1,715	2,937	454
Poultry	12,432	21,314	2,625
Livestock per operator:	*Head*	*Head*	*Head*
Oxen[2]	.5	.9	1.6
Other cattle	1.8	3.6	14.9
Horses and mules	.9	1.5	3.5
Burros	.7	1.4	.7
Sheep	1.0	2.0	4.8
Goats	1.9	3.2	4.7
Hogs	1.5	3.2	1.6
Poultry	10.9	22.9	9.1

[1]A hectare equals 2.471 acres.

[2]Includes steers, bulls, and cows worked.

Source: Census of Agriculture, 1940.

farms is sure to consist of small units, which will be operated at lower labor efficiency than is common in the United States. With the ejido type of farm, the increase in labor efficiency will be even more difficult to accomplish. The ejido is a political and social institution that has grown out of the Mexican Revolution and that will be defended vigorously against all attempts to modify its form or to reduce the number of persons living on it. Furthermore, the population on ejidos will continue to increase because of natural growth.

AGRICULTURAL CREDIT

The typical Mexican farm has little investment in capital goods, as distinguished from the land. Valuations placed on their capital goods by farmers who were answering the census takers' questions in 1940 probably represented some understatement. Even allowing for this, investments per farm are obviously quite small (table 12). Total evaluation of all property except land amounted to 420 pesos per parcel for ejidatarios, 651 pesos per farm for privately owned farms of 5 hectares or less, and 1,670 pesos per farm of more than 5 hectares. At the rate of exchange prevailing in 1940, these figures were equal to $78, $121, and $310 (U. S. currency), respectively.

Scarcity and high cost of farm credit in Mexico makes it hard to improve the equipment and obtain more efficient motive power even for those farms large enough to use it to advantage.

In 1948 the Banco Nacional de Crédito Ejidal loaned about 180 million pesos to ejidatarios. The greater part of this went to those ejidos that are operated as units rather than as individual parcels and that produce such commercial crops as cotton or wheat. This amount of credit is equal to approximately 157 pesos per ejidatario, or $2.15 (U. S. currency) per acre of cultivated land. Such funds are loaned entirely for purchases of seed, fertilizer, equipment, and farm improvements. There are no loans for purchases of land since ejidal land cannot be purchased or sold.

About the same amount of capital, or roughly 190 million pesos, was loaned to private farmers in 1948 by the Banco Nacional de Crédito Agrícola y Ganadero and by commercial banks. About two-thirds of this came from the commercial banks. This capital amounted to approximately 160 pesos per farm, or $2.30 (U. S. currency) per acre. Like the loans made by the Banco Ejidal, the reported loans to private farmers were for short-run operation or for farm equipment, livestock, and some improvements.

There is very little farm mortgage credit in Mexico. A general feeling of insecurity among larger farmers results from the agrarian policy, in accordance with which farm land in excess of 100 hectares of irrigated or 200 hectares of unirrigated, tillable land may be expropriated for the formation of new ejidos. Consequently, owners of capital are unwilling to risk their funds in farm mortgage loans.

TABLE 12.--Investments in agriculture, Mexico, 1940

Item	Ejidos	Private properties		Total or average
		5 hectares or under[1]	Over 5 hectares	
	1,000 pesos[2]	1,000 pesos	1,000 pesos	1,000 pesos
Investment:				
Land	998,089	143,070	1,664,223	2,805,382
Hydraulic works	52,995	(3)	45,078	98,073
Constructions	119,357	(3)	93,802	213,159
Roads	1,085	(3)	11,040	12,125
Machinery	49,534	5,876	49,581	104,991
Livestock	255,095	598,788	286,341	1,140,224
Total	1,476,155	747,734	2,150,065	4,373,925
Total, except land	478,066	604,664	485,842	1,568,571
Number of operators	1,139,085	928,593	290,336	2,358,014
Investment per operator:	Pesos	Pesos	Pesos	Pesos
Land	876	154	5,732	1,190
Hydraulic works	47	(3)	155	42
Constructions	105	(3)	323	90
Roads	1	(3)	38	5
Machinery	43	6	171	44
Livestock	224	645	986	484
Total	1,296	805	7,405	1,855
Total, except land	420	651	1,673	665

[1]A hectare equals 2.471 acres

[2]Average value of the peso in 1940 was 18.55 U. S. cents.

[3]No data given for investments in constructions, roads, or hydraulic works for private properties of under 5 hectares.

Source: Census of Agriculture, 1940.

Among the smaller farms, earnings are too meager and uncertain to provide adequate assurance of repayment of loans.

Not only is agricultural credit scarce, but interest rates are also extremely high when judged by United States standards. The Banco Agrícola and the Banco Ejidal loan funds to farmers at interest rates nominally of 10 percent and 8 percent, respectively. Besides the interest, there are fees or other charges that increase the cost by 2 to 4 percent, making the total cost of farm credit anywhere from 10 to 15 percent and sometimes higher. The standard interest rate paid by farmers on farm machinery loans is 12 percent.

CONCLUSION

Improvement in the productivity of Mexico's farm labor force may progress in two directions--(1) increased yield per acre of land or per head of livestock, and (2) increased labor efficiency. There are relatively large opportunities for improvements in yield. The rate and the extent to which they are realized will depend chiefly on the wisdom and vigor of governmental action. The Rockefeller Foundation and the Mexican Corn Commission are doing a great deal of work in developing improved crop varieties and in making them available to farmers. To some degree the Corn Commission is also carrying on educational work in regard to the use of fertilizers and green-manure crops. These are essential if the full potential benefit is to be obtained from higher yielding corn varieties.

Similar work might be done advantageously to increase yields of nearly all the other common Mexican crops. Obtaining increased yields with greatest economy, however, requires adoption of improved cultural practices, as well as the planting of good seed and application of fertilizer. These could be put into effect only through a widespread and persistent program of extension education among farmers.

Inefficient use of labor in crop production may be attributed directly to antiquated practices and primitive implements. Replacement of wooden plows with steel ones, and of oxen with horses and mules, would probably almost double the performance of the average Mexican farm worker while he is actually engaged in planting or caring for a crop.

Some progress is being made in this direction, as is shown by the amount of farm machinery that has been imported during recent years. There are, however, three principal impediments:

1. The first is ignorance on the part of farmers in many parts of Mexico regarding improved methods and benefits to be obtained from them. This will gradually be overcome as education and communications are extended. Both education and communications are already making steady strides, and it is safe to conclude that the Mexican rural population of 1960 will be much better informed than is the population of 1950.

The number of schools is gradually being increased. At the same time several dependencies of the Ministry of Agriculture are disseminating information on improved agricultural practices. The number of men engaged in various types of extension work is very small, however, and so is the budget to support them.

2. The second impediment is in the system of land tenure and distribution. Half the cropland has been divided into ejidal parcels that are too small to operate economically and too small to support a family. The political strength of the ejido system, however, is so great that no material change can be expected in this section of Mexican agriculture in the near future. In addition, three-quarters of the privately owned farms are as small as the ejidal parcels.

There seems to be only one possible means of shifting excess population and labor force out of agriculture. This lies in the chance that there may, at some time in the future, be sufficient urban employment opportunities to induce excess farmers to leave the land. There is already a marked rural-urban migration. But virtually all of it seems to come from the natural rural increase. The rate of farm consolidation is sure to be very slow.

3. The third impediment to increased labor efficiency is in the scarcity and high price of agricultural credit. The Government is making an effort to increase the supply of farm credit, but it is extremely inadequate.

More and cheaper credit alone would not solve the problems of inefficient use of labor and low yields, but it might ameliorate them. A reduction of interest rates from, say, 12 percent to 6, with a corresponding increase in the supply of loanable funds, might well double the rate of small-scale mechanization. The amount of capital required would not be so great as might be supposed. Total agricultural investments, other than in land, were reported in the 1940 census as 1,569 million pesos, or 290 million dollars at the exchange rate then existing. An additional 290 million dollars would not seem to constitute a very great requirement for a nation of more than 20 million people. But the lack of security in rural property has prevented needed funds from being offered by commercial banking institutions.

Mexico is undoubtedly progressing in agriculture, especially in the sector held as private property. The Government is making a relatively large contribution in comparison with other Latin American governments. Technological and economic progress is always slow. Nevertheless, the more alert private farmers in Mexico are energetically seeking and adopting improved methods. At this stage of development it may well be that they are advancing faster than most farmers in the United States.